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Sato

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(54) **REPRODUCTION APPARATUS AND
REPRODUCTION METHOD**

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See application file for complete search history.

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H04N 9/82 (2006.01)
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G11B 27/32 (2006.01)
G11B 27/031 (2006.01)

(52) **U.S. Cl.**

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27/322 (2013.01); **H04N 5/772** (2013.01);
H04N 9/7921 (2013.01); **H04N 9/8205**
(2013.01)

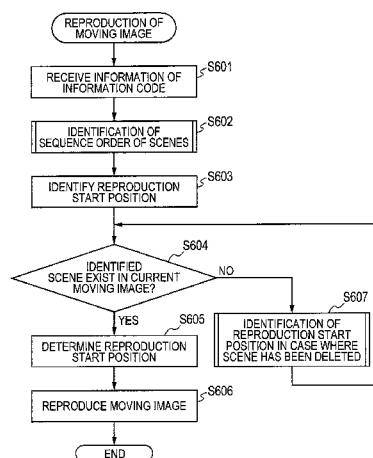
(58) **Field of Classification Search**

CPC H04N 9/87; H04N 5/772; H04N 9/7921;
H04N 9/8205; G11B 27/034; G11B 27/322;
G11B 27/031

(57) **ABSTRACT**

A reproduction apparatus, which is provided to reproduce a
moving image recorded in a recording apparatus, includes:
a storage unit configured to store change information indi-
cating a change of a position of a scene included in the
moving image recorded in the recording apparatus; a receiv-
ing unit configured to receive start information designating
a reproduction start position of the moving image based on
a reference position of the moving image before the change
of the position of the scene; and an identifying unit config-
ured to identify the distance from the reference position to
the reproduction start position changed by the change of the
position of the scene, on the basis of the change information
and the start information received by the receiving unit.

17 Claims, 13 Drawing Sheets



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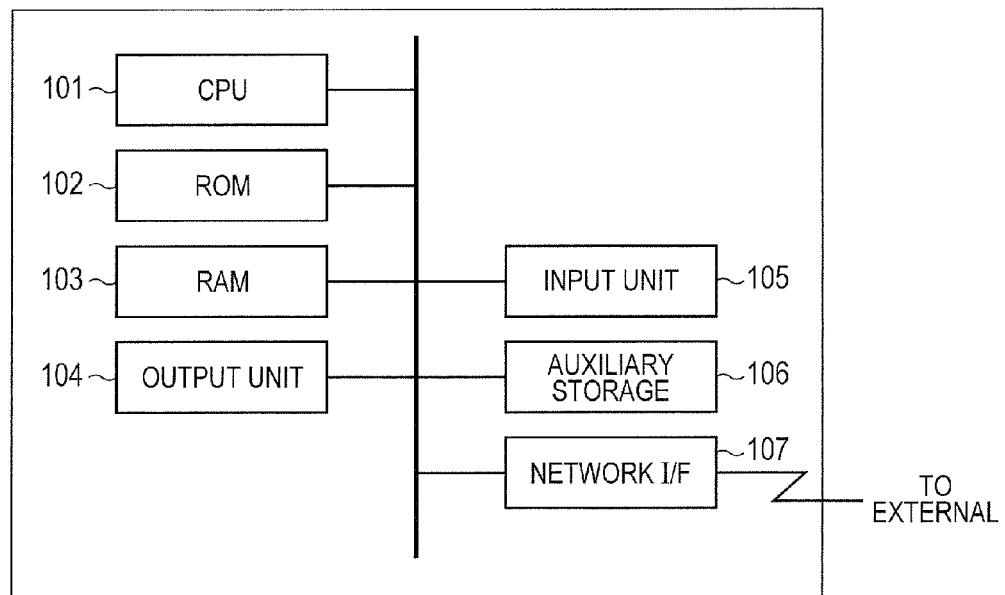
FIG. 1

FIG. 2

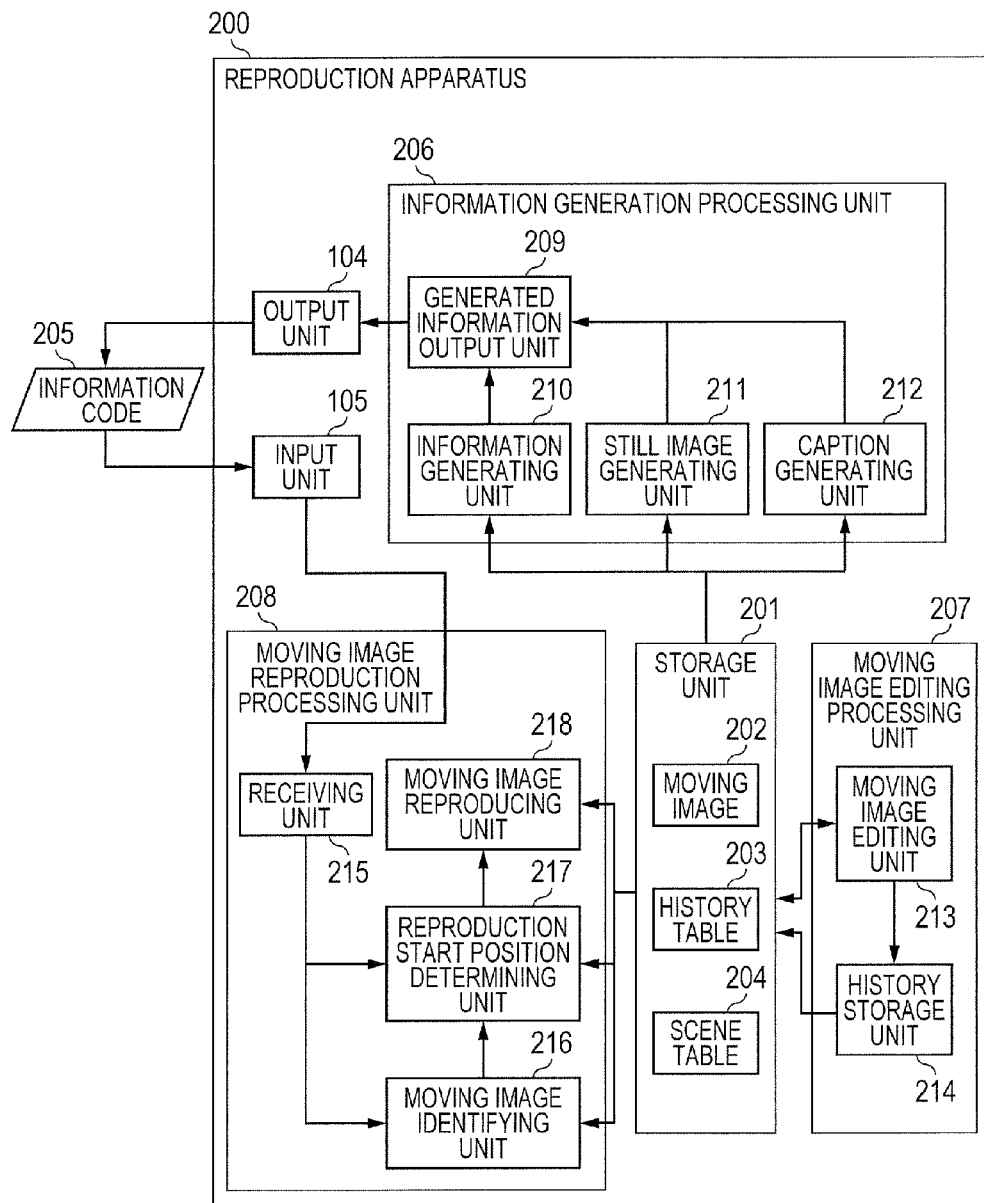


FIG. 3A

VERSION NUMBER	EDITING HISTORY
1	SCENE SEQUENCE OF SCENES A, B, C, D, E (ORIGINAL STATE)
2	PLACE SCENE C AT THE HEAD
3	PLACE SCENE D BEFORE SCENE B
...	...
28	PLACE SCENE B AT THE END

FIG. 3B

EDITING DATE AND TIME	EDITING HISTORY
...	...
06/28/20xx	MOVE SCENE C PLACED AFTER SCENE B
07/04/20xx	MOVE SCENE D PLACED AFTER SCENE B SCENE SEQUENCE OF SCENES C, A, D, B, E (LATEST STATE)

FIG. 3C

VERSION NUMBER	EDITING HISTORY
...	...
3	SCENE SEQUENCE OF SCENES A, B, C, D, E
4	SCENE SEQUENCE OF SCENES C, A, B, D, E
...	...
12	SCENE SEQUENCE OF SCENES C, A, D, B, E

FIG. 4A

SCENE	SCENE A	SCENE B	SCENE C	SCENE D	SCENE E
REPRODUCTION TIME LENGTH	10 SECONDS	20 SECONDS	10 SECONDS	20 SECONDS	30 SECONDS

FIG. 4B

SCENE ID	SCENE A	SCENE B	SCENE C	SCENE D	SCENE E
SCENE LENGTH	1000 FRAMES	2000 FRAMES	1000 FRAMES	2000 FRAMES	3000 FRAMES

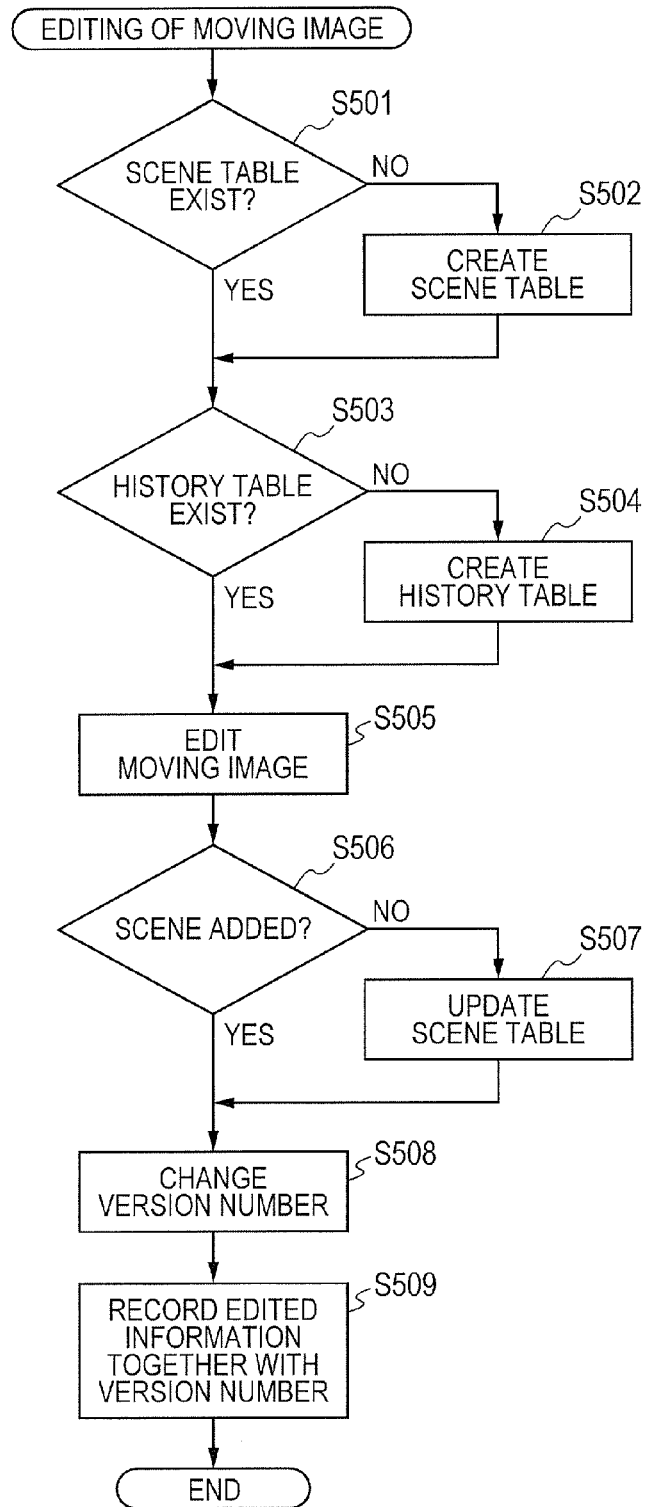
FIG. 5

FIG. 6

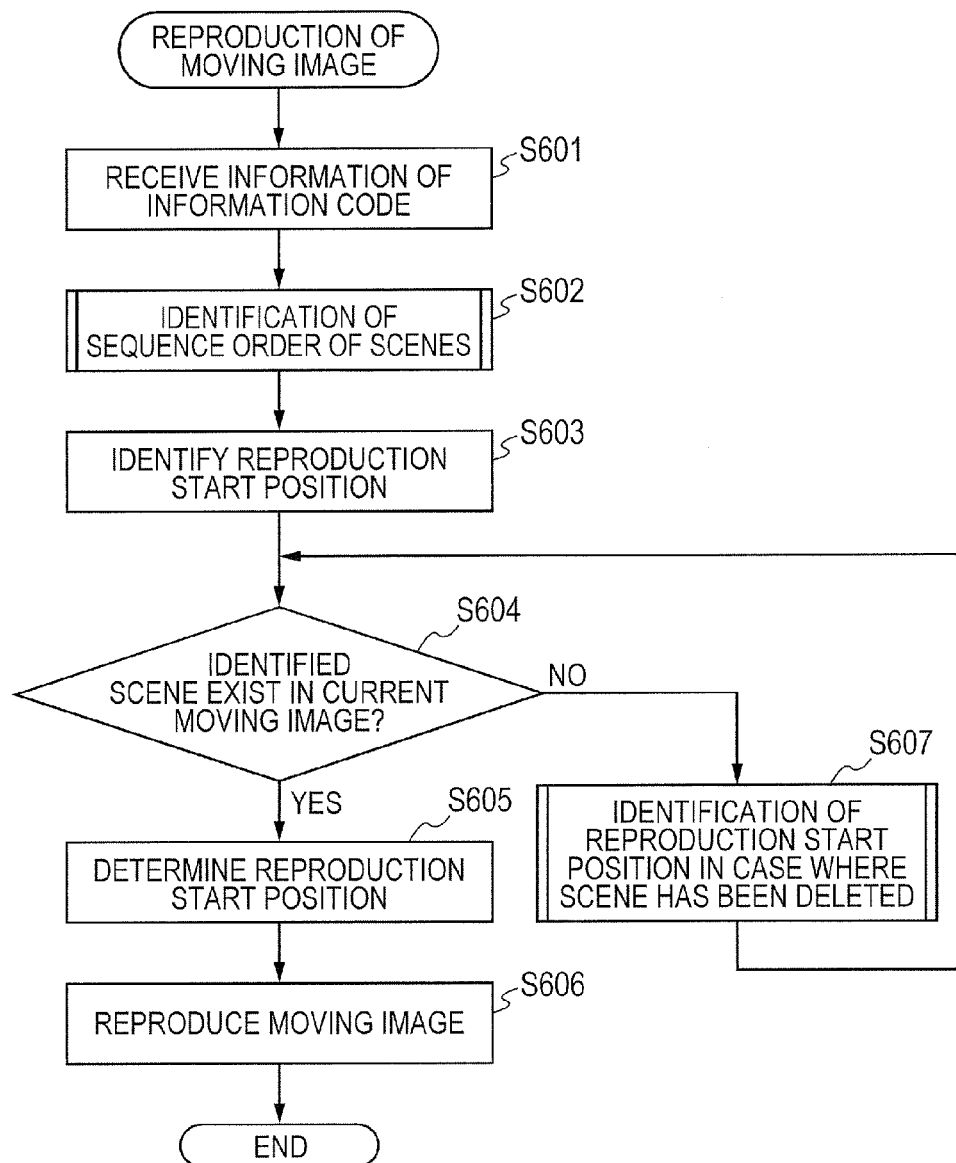


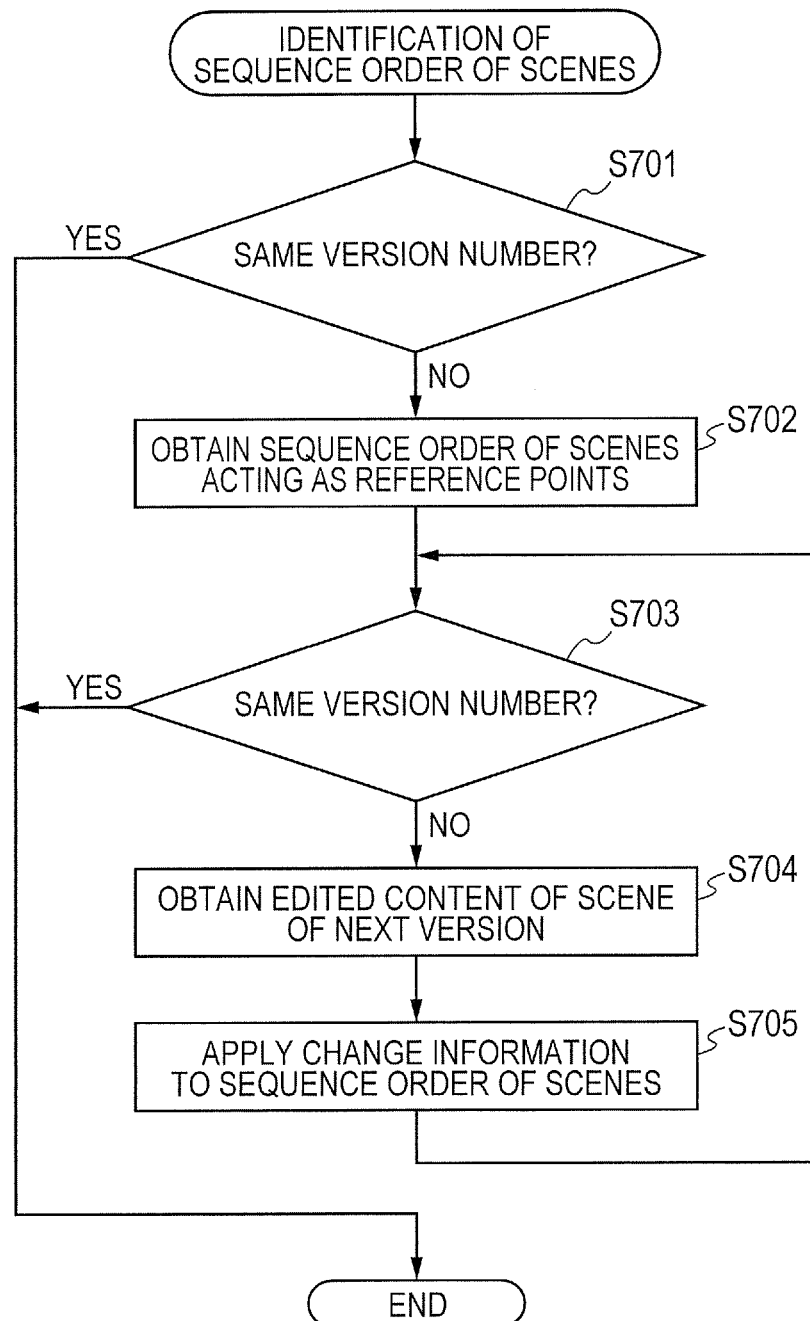
FIG. 7

FIG. 8

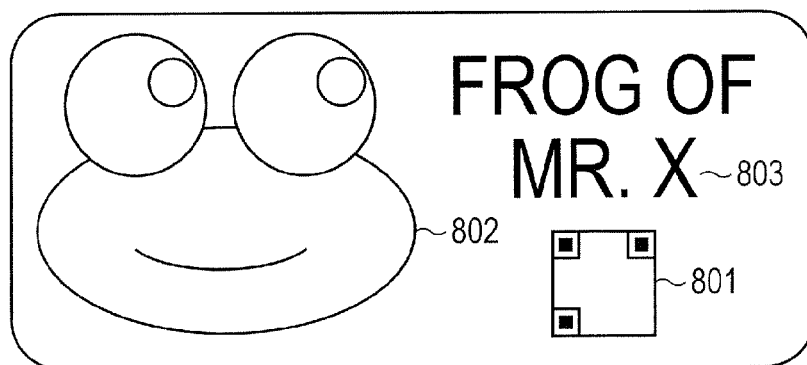


FIG. 9

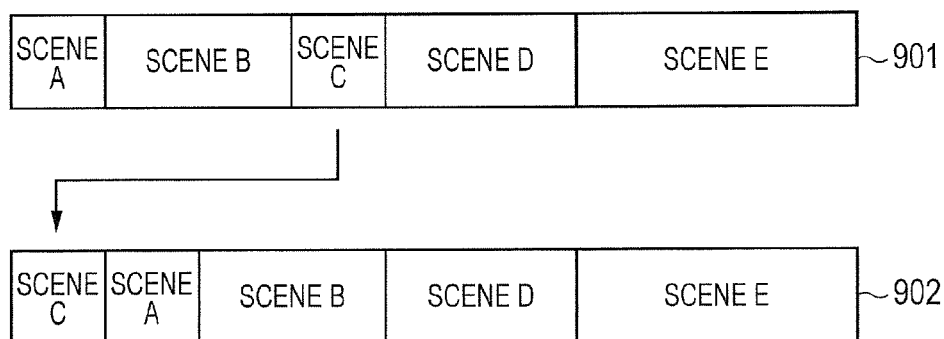


FIG. 10

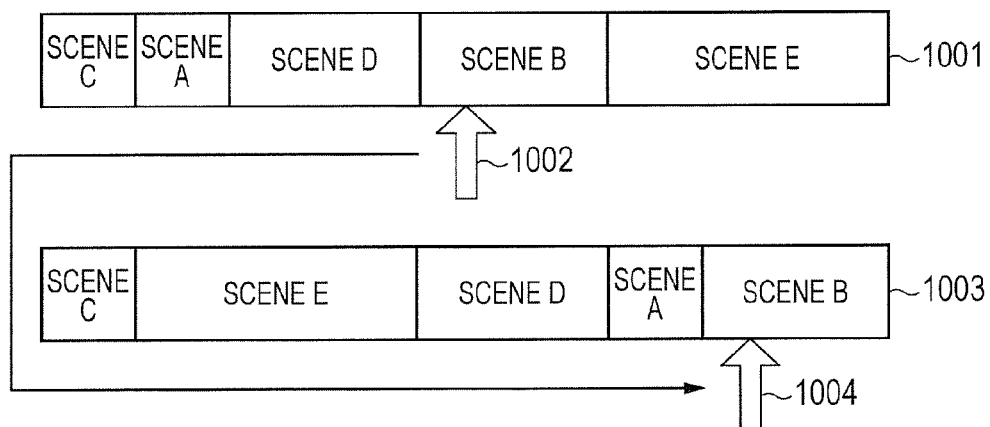


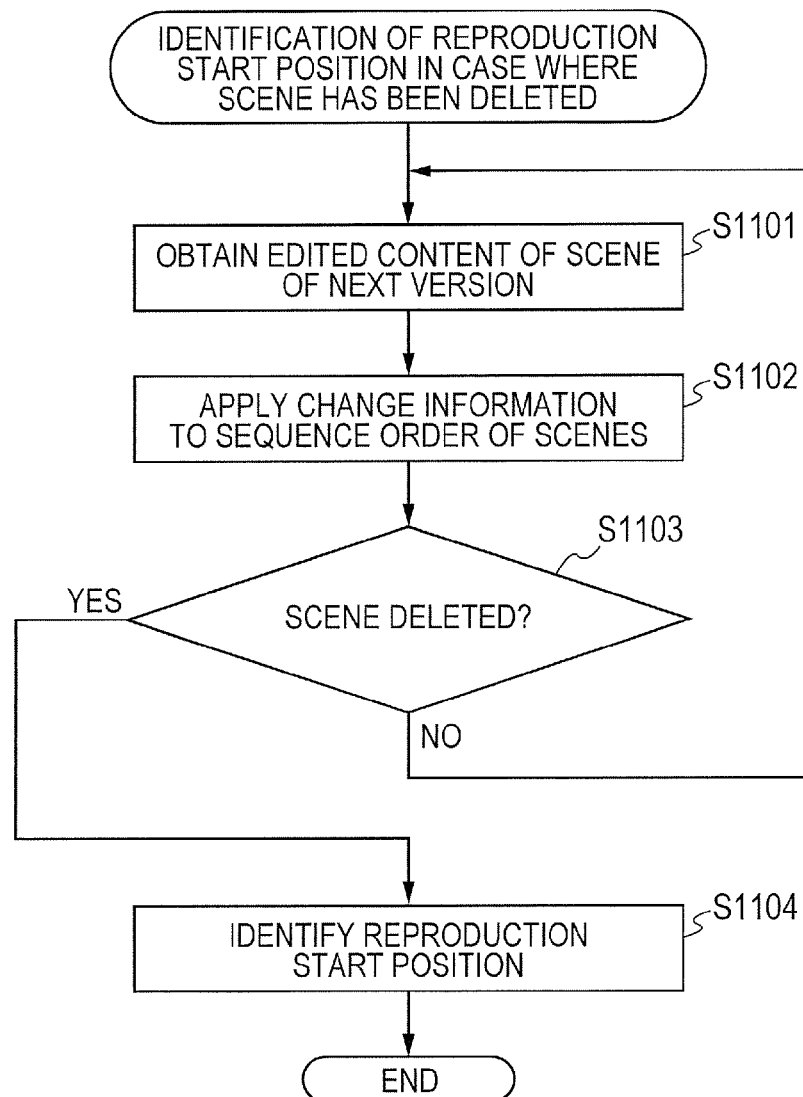
FIG. 11

FIG. 12

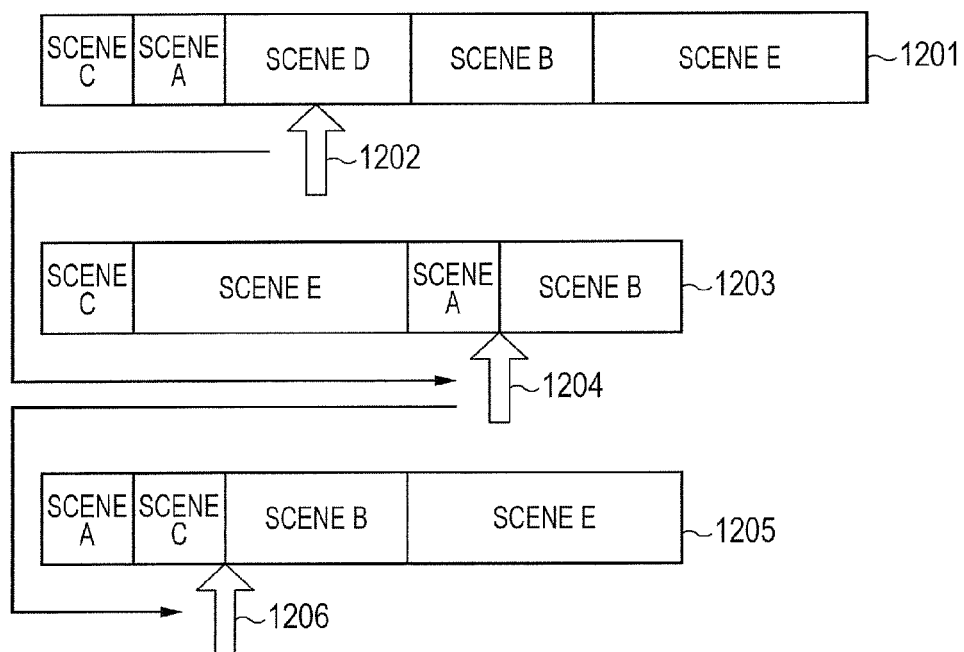


FIG. 13

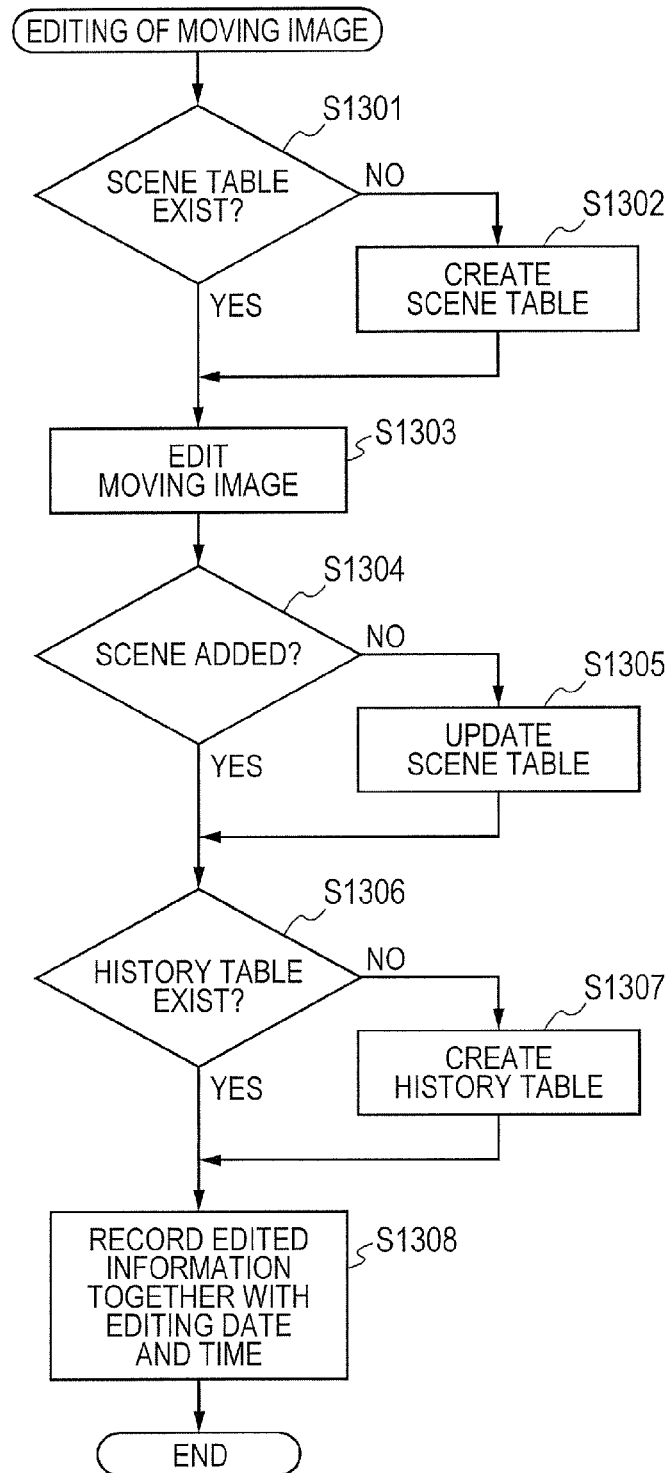


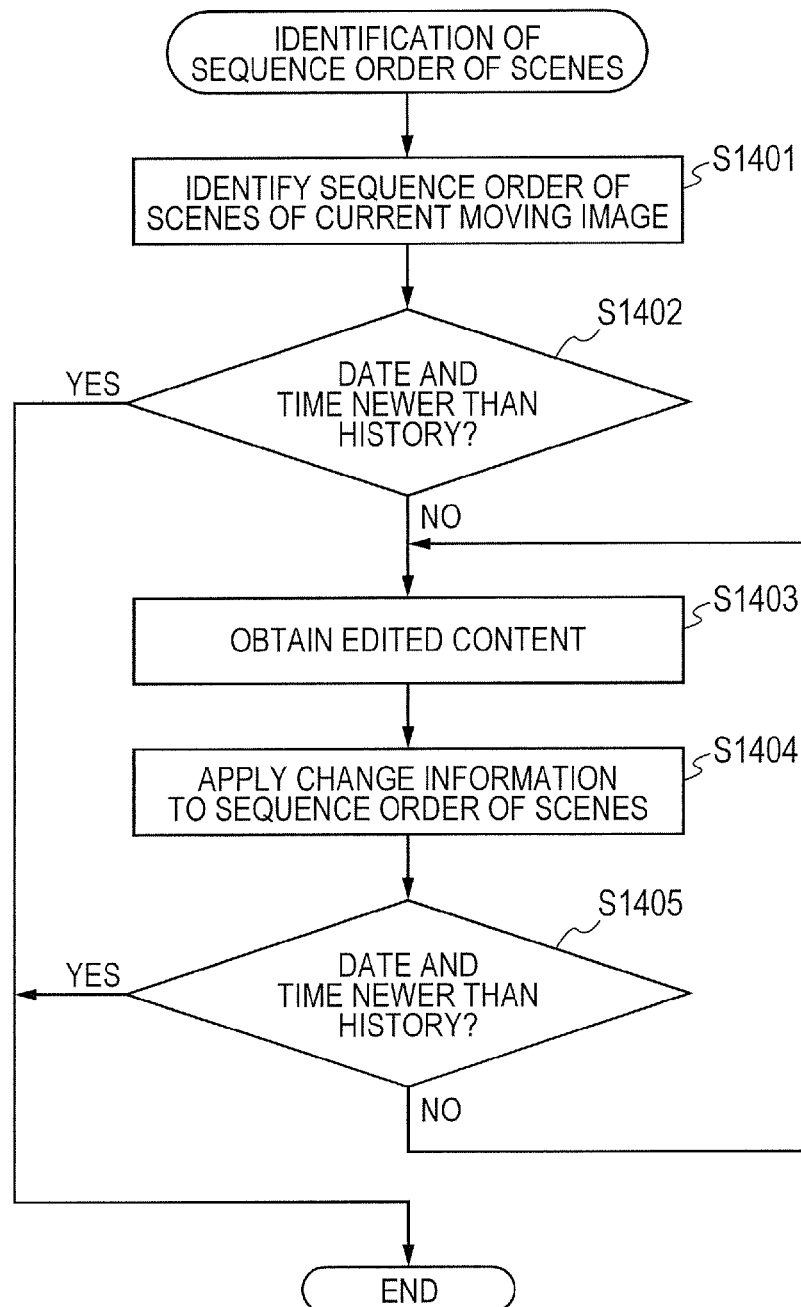
FIG. 14

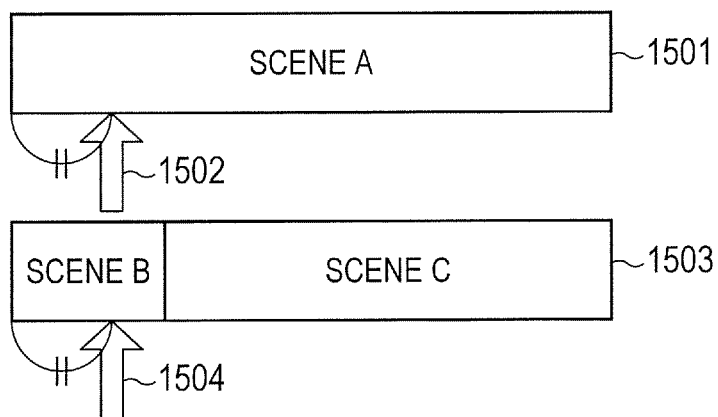
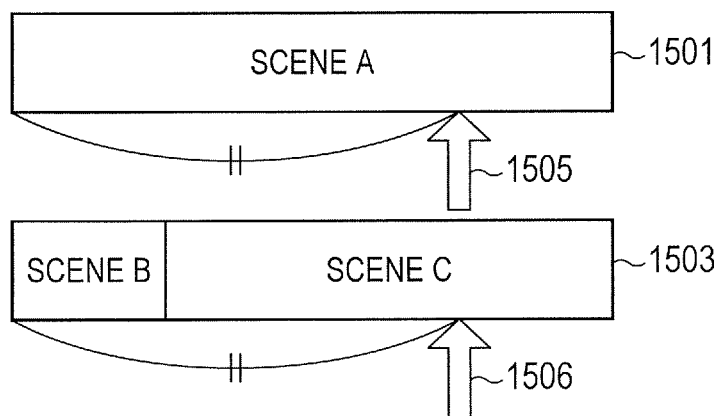
FIG. 15A*FIG. 15B*

FIG. 16A

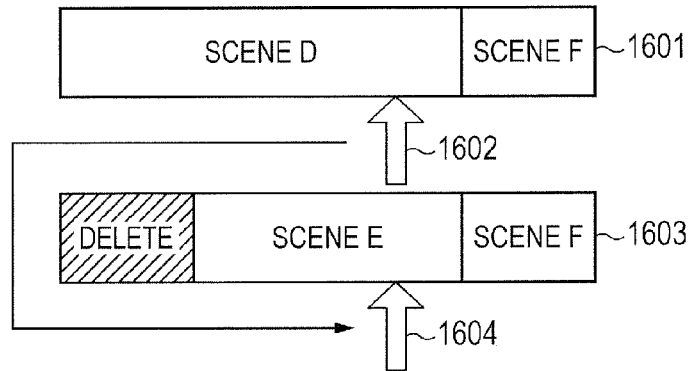


FIG. 16B

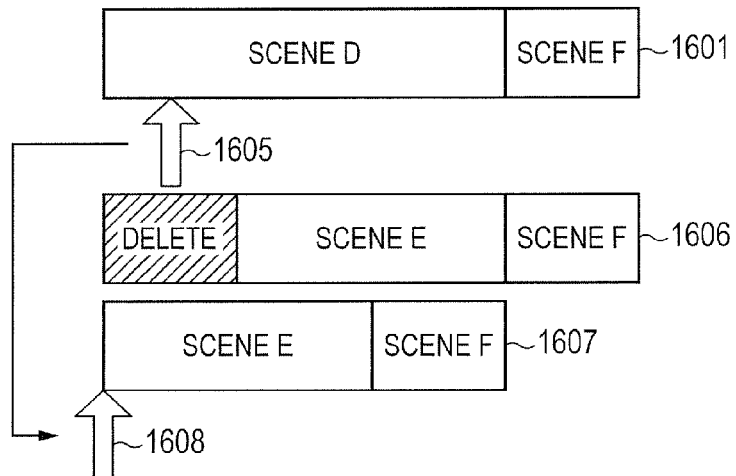
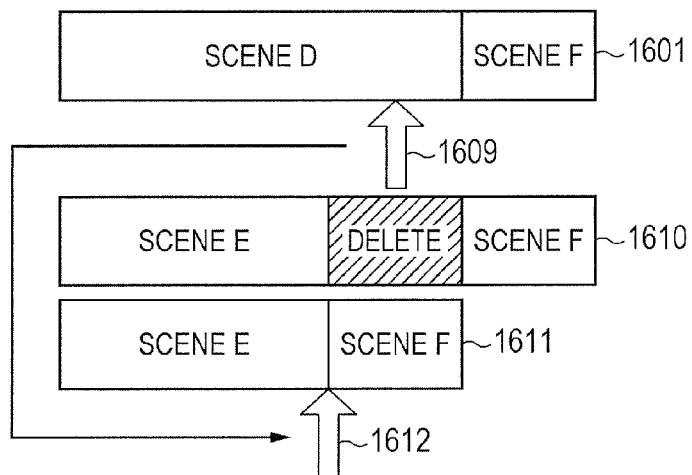


FIG. 16C



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REPRODUCTION APPARATUS AND REPRODUCTION METHOD

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a reproduction apparatus and a reproduction method, and, in particular, to a technique which is suitably used to reproduce a moving image from a specific position.

2. Description of the Related Art

In recent years, it has become possible to reproduce moving images in various environments. In a case where a user starts watching a moving image, reproduction of the moving image is generally started from the head thereof. Here, each of Japanese Patent Application Laid-Open Nos. 2001-069487 and 2006-013792 discloses a technique of reproducing a moving image from the middle by using information including specific position information indicating a specific position of the moving image from which the reproduction is started.

Further, in a case where a moving image is edited, data which concerns the moving image and was used before the moving image is edited cannot be used because its consistency is lost. Consequently, Japanese Patent Application Laid-Open No. 2002-351878 discloses a technique of maintaining consistency of data even after editing of a moving image, by previously embedding information enabling to restore the data in each frame of the moving image.

However, in the technique disclosed in each of Japanese Patent Application Laid-Open Nos. 2001-069487 and 2006-013792, as described above, if the moving image after the editing is reproduced from the middle by using the information indicating the reproduction start position generated before the editing, there is a problem that the moving image is reproduced from an unintended position which is different from the reproduction start position intended before the editing.

Further, in the technique disclosed in Japanese Patent Application Laid-Open No. 2002-351878, although the moving image after the editing can be restored so as to be in the state same as that before the editing, there is a problem that a user oneself has to select the reproduction start position to reproduce the moving image from the middle. Moreover, if history information is used to reproduce the moving image in such a case, there is a problem that a capacity of the moving image increases in proportion to the number of times of the editing.

The present invention, which has been completed in consideration of the above problems, intends to be able to reproduce the moving image generated after the editing from the middle as well as the moving image generated before the editing, by using the information for reproducing, from the middle, the moving image generated before the editing.

SUMMARY OF THE INVENTION

To achieve such a problem as described above, in the present invention, a reproduction apparatus, which reproduces a moving image recorded in a recording apparatus, is characterized by comprising: a storage unit configured to store change information indicating a change of a position of a scene included in the moving image recorded in the recording apparatus; a receiving unit configured to receive start information designating a reproduction start position of the moving image based on a reference position of the moving image before the change of the position of the scene;

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and an identifying unit configured to identify a distance from the reference position to the reproduction start position changed by the change of the position of the scene, on the basis of the change information and the start information received by the receiving unit.

Further features of the present invention will become apparent from the following description of exemplary embodiments with reference to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram illustrating an overall constitution of a reproduction apparatus.

FIG. 2 is a block diagram illustrating function blocks of the reproduction apparatus.

FIGS. 3A, 3B and 3C are diagrams illustrating examples of history tables according to first, second and third embodiments of the present invention, respectively.

FIGS. 4A and 4B are diagrams illustrating examples of scene tables according to the first and second embodiments of the present invention, respectively.

FIG. 5 is a flow chart illustrating an example of an editing process of a moving image according to the first embodiment of the present invention.

FIG. 6 is a flow chart illustrating an example of a reproduction process of the moving image according to the first embodiment of the present invention.

FIG. 7 is a flow chart illustrating an example of a scene sequence order identifying process to be performed in the reproduction process according to the first embodiment of the present invention.

FIG. 8 is a diagram illustrating an example of reproduction information to be output by an information generation processing unit 206.

FIG. 9 is a diagram for illustrating a change of a sequence order of scenes.

FIG. 10 is a diagram illustrating correspondence between a reproduction start position in video data before editing and a reproduction start position in the video data after the editing.

FIG. 11 is a flow chart illustrating a reproduction start position identifying process in a case where a designated scene has been deleted.

FIG. 12 is a diagram for illustrating the reproduction start position identifying process in the case where the designated scene has been deleted.

FIG. 13 is a flow chart illustrating an example of an editing process of a moving image according to the second embodiment of the present invention.

FIG. 14 is a flow chart illustrating an example of a scene sequence order identifying process to be performed in a reproduction process according to the second embodiment of the present invention.

FIGS. 15A and 15B are diagrams for illustrating a reproduction start position identifying process in a case where a scene is divided.

FIGS. 16A, 16B and 16C are diagrams for illustrating the reproduction start position identifying process in a case where the scene is deleted.

DESCRIPTION OF THE EMBODIMENTS

Hereinafter, preferred embodiments of the present invention will be described in detail with reference to the accompanying drawings. Incidentally, it should be noted that constitutions described in the following embodiments are

merely equivalent to examples, and the present invention is not limited to the described embodiments.

<First Embodiment>

FIG. 1 is a block diagram illustrating an example of a hardware constitution of a reproduction apparatus according to the first embodiment of the present invention. A CPU (central processing unit) **101**, which is constituted by a microprocessor and the like, controls the whole reproduction apparatus. A ROM (read only memory) **102** stores therein programs and the like, and a RAM (random access memory) **103** stores therein the running program and also temporarily stores data and the like used for the running program.

An auxiliary storage **106**, which is used to store a program, data and the like, is constituted by a hard disk and the like. An output unit **104**, which is constituted by a display, a printer and the like, outputs information. An input unit **105**, which is constituted by a keyboard, a mouse, buttons, a touch display, a camera, a bar code scanner and the like, inputs and/or receives information. A network I/F (interface) **107** is used to connect with an external device.

FIG. 2 is a block diagram illustrating an example of a functional constitution of the reproduction apparatus according to the present embodiment. Incidentally, it should be noted that the reproduction apparatus illustrated in FIG. 1 corresponds to a reproduction apparatus **200** illustrated in FIG. 2. The reproduction apparatus **200** includes an information generation processing unit **206**, a moving image editing processing unit **207**, a moving image reproduction processing unit **208** and a storage unit **201**.

Here, each function of the reproduction apparatus **200** is achieved when the corresponding program read from the ROM **102** or the like is executed by the CPU **101**.

The storage unit **201** records and reads the data used in the reproduction apparatus **200** to and from the auxiliary storage **106** and/or the RAM **103**. The storage unit **201** treats data such as a moving image **202**, a history table **203**, a scene table **204** and the like. Here, the moving image **202**, which is a moving image to be reproduced, is stored in the storage unit **201**. The moving image **202** is composed of one or more scenes, the scene is equivalent to a moving image interval from a certain start point to a certain termination point in the moving image, and each scene includes an inherent scene identifier.

The scene serves as an editing unit when the moving image is edited. In the present embodiment, the editing implies operations of moving the position of the scene constituting the moving image, inserting the scene, and deleting the scene. Further, the moving image **202** may include history identification information. Here, the history identification information is an identifier capable of identifying the moving image **202** at a certain point. In the present embodiment, it is assumed that the history identification information is equivalent to a version number. Here, the version number is a value which is changed every time the moving image **202** is edited.

The history table **203** is a table on which a history of operations of associating the history identification information of the moving image **202** and change information of the moving image **202** with each other has been recorded (this table is created in a first storing process to be performed in regard to a first storage medium). Here, the change information is information indicating how the moving image **202** has been edited. FIG. 3A is a diagram illustrating an example of the history table **203**. In FIG. 3A, the version number is used as the history identification information, and an editing history is used as the change information.

The scene table **204** is a table on which the scene identifier of each scene constituting the moving image **202** and one or a plurality of scene reproduction time lengths have been associated with each other and recorded (this table is created in a second storing process to be performed in regard to a second storage medium).

FIG. 4A is a diagram illustrating an example of the scene table **204**. FIG. 4A particularly illustrates a case where the moving image **202** is constituted by five scenes of a scene A, a scene B, a scene C, a scene D and a scene E. Here, the upper row of the table indicates the scene identifier, and the lower row of the table indicates the reproduction time length of the scene indicated by the scene identifier. For example, FIG. 4A shows that the reproduction time length of the scene A is 10 seconds. Likewise, each of other scenes is recorded as a set of the scene and the reproduction time length.

Information code **205** is an identifier such as a bar code or the like, which includes a moving image identifier indicating the moving image **202** to be reproduced, identification information for identifying one of the history identification information, and start information of the moving image **202**. Here, it should be noted that the moving image identifier has a unique value which is not changed even if the moving image **202** is edited. The start information is reproduction start position information capable of identifying the frame from which the reproduction of the moving image **202** is started.

In the present embodiment, if the moving image **202** is reproduced from its head, a reproduction start position is equivalent to a time which elapses up to the frame from which a user intends to start the reproduction of the moving image. For example, if the reproduction start position of the moving image **202** is 30 seconds, the reproduction of the moving image **202** is started from the frame which is at a 30-second point from the head of the moving image.

Further, the information code **205** may include termination information of the moving image **202**. Here, the termination information is reproduction termination position information capable of identifying the frame at which the reproduction of the moving image **202** is terminated. In the present embodiment, if the moving image **202** is reproduced from its head, a reproduction termination position is equivalent to a time which elapses from the head up to the frame at which a user intends to terminate the reproduction of the moving image. Alternatively, if the moving image **202** is reproduced from the reproduction start position, the reproduction termination position is equivalent to a time which elapses from the reproduction start position up to the frame at which a user intends to terminate reproduction of the moving image. In any case, it is possible by using the start information and the termination information to reproduce a specific range of the moving image **202**.

In the present embodiment, the form of the information code **205** is not limited to the bar code. Namely, it is possible to use any form such as a two-dimensional code, a still image in which information has been embedded, an RF (radio frequency) tag, a URI (Uniform Resource Identifier) character string or the like which can be interpreted by the reproduction apparatus **200** with use of an appropriate input method. In the reproduction apparatus **200**, the information code **205** is output by the output unit **104** and input from the input unit **105**.

The information generation processing unit **206** includes an information generating unit **210** and a generated information output unit **209**. The information generating unit **210** obtains, from the moving image **202** to be reproduced, the moving image identifier indicating the moving image **202**

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and one of the version numbers of the moving image **202** as the identification information, and generates the reproduction start position information of the moving image **202** in the relevant version.

The generated information output unit **209** receives the information from the information generating unit **210**, and outputs the received information as the information code **205** to an appropriate medium such as a paper, a display or the like through the output unit **104**. Further, the information generation processing unit **206** may include a still image generating unit **211** which generates such a still image as representing a scene content of the moving image **202**. In this case, the generated information output unit **209** also outputs the still image, received from the still image generating unit **211**, to an appropriate medium through the output unit **104**.

Further, the information generation processing unit **206** may include a caption generating unit **212** which generates such a caption as representing a scene content. In this case, the generated information output unit **209** also outputs the caption, received from the caption generating unit **212**, to an appropriate medium through the output unit **104**.

The moving image editing processing unit **207** includes a moving image editing unit **213** and a history storage unit **214**. The moving image editing unit **213** edits the moving image **202**, and transfers change information based on the editing to the history storage unit **214**. Incidentally, with respect to each of the scenes constituting the moving image **202**, the scene identifier indicating the scene and the reproduction time length of the scene are associated with each other and recorded on the scene table **204**.

The history storage unit **214** records, on the history table **203**, the change information together with the history identification information of the moving image **202**. The moving image reproduction processing unit **208** includes a receiving unit **215**, a moving image identifying unit **216**, a reproduction start position determining unit **217** and a moving image reproducing unit **218**. The receiving unit **215** obtains, from the information code **205** input from the input unit **105**, the moving image identifier indicating the moving image **202**, the version number serving as the history identification information, and the reproduction start position information of the moving image **202** in the version identified based on the version number. Then, the receiving unit **215** transfers the moving image identifier and the version number (version information) to the moving image identifying unit **216**, and also transfers the moving image identifier and the reproduction start position information to the reproduction start position determining unit **217**.

The moving image identifying unit **216** constructs a sequence of the scenes of the moving image **202** identified by the version number, by referring to the history table **203**, and then notifies the reproduction start position determining unit **217** of the constructed sequence. In any case, a detailed process flow of this operation will be described later.

The reproduction start position determining unit **217** determines the reproduction start position in the current moving image **202**, by referring to the sequence of the scenes constructed by the moving image identifying unit **216** and the scene table **204**, and then notifies the moving image reproducing unit of the determined reproduction start position. Subsequently, the moving image reproducing unit **218** reproduces the moving image **202** from the reproduction start position determined by the reproduction start position determining unit **217**. In a case where also the reproduction termination position information is obtained from the information code, the reproduction termination position in the

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current moving image **202** may be determined in the same manner as that of determining the reproduction start position, and thus the moving image **202** may be reproduced from the moving image reproduction start position to the moving image reproduction termination position.

The above functional constitution may be achieved by a single reproduction apparatus, or, alternatively, the above functional constitution may be divided and then achieved respectively by a plurality of apparatuses according to need. Further, data such as the moving image **202** may be divided and disposed respectively to different devices. In a case where the above functional constitution is achieved by a plurality of devices, these devices are mutually connected communicably by a computer network such as a LAN (local area network) or the like.

Subsequently, processing flows in the present embodiment will be described with reference to respective flow charts illustrated in FIGS. **5**, **6**, **7** and **11**. Initially, an example of the process of the moving image editing processing unit **207** for editing the moving image **202** in the present embodiment will be described with reference to the flow chart illustrated in FIG. **5**.

First, in **S501**, the moving image editing unit **213** confirms whether or not the scene table **204** for the moving image **202** exists. If the scene table **204** does not exist, in **S502**, the moving image editing unit **213** obtains the scene identifier indicating each of the scenes constituting the moving image **202** and the reproduction time length of the corresponding scene, creates the scene table **204** for the moving image **202**, and then records the obtained scene identifier and the reproduction time length on the created table. Alternatively, the moving image editing unit **213** divides the moving image **202** into the plurality of scenes, allocates the scene identifier to each of the divided scenes, creates the scene table **204** for the moving image **202**, and then records the allocated scene identifier together with the corresponding reproduction time length on the created table.

In **S503**, the moving image editing unit **213** confirms whether or not the history table **203** corresponding to the moving image **202** exists. If the history table **203** does not exist, in **S504**, the moving image editing unit **213** newly creates the history table **203**. Here, as illustrated in FIG. **3A**, the first version number "1" and a sequence order (or sorting order) of the scenes constituting the moving image **202** at this moment are associated and recorded on the table.

Next, in **S505**, the moving image editing unit **213** edits the moving image **202**. Further, the moving image editing unit **213** temporarily stores therein the change information being the edited content of the moving image **202**. Incidentally, if a new scene is added in the editing in **S505**, the scene table is updated (**S506**, **S507**).

Next, in **S508**, the moving image editing unit **213** changes the version number of the edited moving image **202**, and notifies the history storage unit **214** of the change information and the changed version number. Finally, in **S509**, the history storage unit **214** associates the change information and the version information with each other, and records them on the history table **203**.

Then, an example of the process of the information generation processing unit **206** for generating reproduction information of the moving image **202** in the present embodiment will be described. Here, the reproduction information is information to be used to reproduce the moving image **202** from a designated reproduction start position. FIG. **8** illustrates an example of the reproduction information which has been output on a paper. More specifically, the reproduction information includes an information code **801**. Moreover,

the reproduction information may include a still image (thumbnail) **802** indicating the scene content of the moving image **202** to be reproduced, a caption **803** indicating the scene content, and the like. The still image **802** and the caption **803** are used to help a person to understand the meaning of the information code **801**. Incidentally, the information code **801** in FIG. **8** corresponds to the information code **205** in FIG. **2**.

First, the information generating unit **210** generates the information code **205**. Besides, the information generating unit **210** obtains the moving image identifier and the version number of the moving image **202** to be reproduced, determines the reproduction start position of the moving image **202**, and then generates the information code **801** including the moving image identifier, the version number and the reproduction start position.

Next, if necessary, it is possible to perform a process of generating the thumbnail, and/or a process of generating the caption. The still image generating unit **211** generates the still image **802** indicating the scene content, and the caption generating unit **212** generates the caption **803** indicating the scene content.

Finally, the generated information output unit **209** outputs the information code **205**, the still image **802** if the thumbnail has been generated, and the caption **803** if the caption has been generated, through the output unit **104**.

Then, an example of the process of the moving image reproduction processing unit **208** for reproducing the moving image **202** in the present embodiment will be described with reference to the flow chart illustrated in FIG. **6**. First, in **S601**, the receiving unit **215** reads the information code **205** through the input unit **105**, and thus obtains the moving image identifier indicating the moving image **202**, the version number, and the reproduction start position.

Next, in **S602**, the moving image identifying unit **216** receives the moving image identifier and the version number from the receiving unit **215**, and identifies the sequence order of the scenes of the moving image **202** identified by the moving image identifier in the version identified by the version number, by referring to the history table **203**.

Here, an example of the process of the moving image identifying unit **216**, to be performed in **S602**, for identifying the sequence order of the scenes of the moving image **202** in the version identified by the version number will be described with reference to the flow chart illustrated in FIG. **7**.

In **S701**, the version number may be compared in advance with the latest version number in the moving image **202** or on the history table **203**. If these version numbers are the same, it is unnecessary to perform subsequent processes. This is because it turns out at this point that the moving image **202** is not edited after the information code **205** was generated. That is, it is apparent that the sequence of the scenes of the moving image **202** in the version number obtained from the information code **205** is the same as the sequence of the scenes of the current moving image **202**. On the other hand, if these two version numbers are not the same, it turns out that the moving image **202** is edited after the information code **205** was generated.

Next, in **S702**, the moving image identifying unit **216** obtains the sequence of the scenes acting as reference points from the history table **203**, and temporarily stores the obtained sequence. That is, in FIG. **3A**, the sequence order of the scenes in an original state (in order of scenes A, B, C, D, E) which has been associated with the version 1 is obtained and temporarily stored.

Next, in **S703**, it is determined whether or not the version number obtained from the information code **205** and the version number obtained from the history table **203** are the same by comparing these version numbers with each other. Incidentally, if the determination in **S701** was already performed, the determination in **S703** may be skipped because the first determination in **S703** certainly arrives at the result that these version numbers are not the same.

If it is determined in **S703** that these version numbers are not the same, the process advances to **S704**. In this step, the change information which is the edited content of the scene corresponding to the next version number is obtained from the editing history information of the history table **203**.

Next, in **S705**, the change information obtained from the history table **203** is applied to the temporarily stored sequence of the scenes.

An example of the process to be performed in **S705** will be described with reference to FIG. **9**. For example, in a case where a sequence **901** of scenes is a sequence of "SCENE A, SCENE B, SCENE C, SCENE D, SCENE E" and the change information indicates "place SCENE C at the head", a sequence **902** of scenes to which the change information has been applied is a sequence of "SCENE C, SCENE A, SCENE B, SCENE D, SCENE E". This sequence **902** is temporarily stored again, and the process returns to **S703**.

Then, if it is determined in **S703** that the two version numbers are the same, the process of identifying the sequence order of the scenes is terminated.

The description returns to FIG. **6**. In **S603**, the reproduction start position determining unit **217** receives the moving image identifier and the reproduction start position information from the receiving unit **215**, and further receives the constructed sequence order of the scenes from the moving image identifying unit **216**. Then, with reference to the scene table **204** and the received sequence order of the scenes, the reproduction start position determining unit **217** performs a reproduction start scene identifying process of identifying which scene the reproduction start position corresponds to, and a reproduction start position identifying process of identifying which position in the scene the reproduction start position corresponds to.

Next, in **S604**, the reproduction start position determining unit **217** determines whether or not the scene in which the reproduction start position has been identified exists in the current moving image **202**.

If it is determined in **S604** that the scene in which the reproduction start position has been identified does not exist, the process advances to **S607** to again identify the reproduction start position. Incidentally, the process of again identifying the reproduction start position to be performed in **S607** will be described later. After the reproduction start position was identified again, it is again determined whether or not the scene in which the reproduction start position has been identified exists (**S604**).

If it is determined in **S604** that the scene in which the reproduction start position has been identified exists, the process advances to **S605**. In this step, the reproduction start position determining unit **217** performs a reproduction start position determining process of determining the reproduction start position in the current moving image **202**. Since which scene and which position the reproduction start position corresponds to have been identified in **S603**, the reproduction start position in the current moving image **202** can be determined by applying the specified scene and position to the sequence of the scenes of the current moving image **202**.

Finally, in **S606**, the moving image reproducing unit **218** reproduces the moving image **202** indicated by the moving image identifier, from the reproduction start position determined by the reproduction start position determining unit.

Next, the reproduction start position identifying process (**S603**) and the reproduction start position determining process (**S605**) to be performed by the reproduction start position determining unit **217** by using, e.g., the scene table **204** illustrated in FIG. 4A will be described with reference to FIG. 10.

For example, it is assumed that the reproduction start position information received by the reproduction start position determining unit **217** from the receiving unit **215** indicates “45 seconds”, and that a sequence order **1001** of the scenes constructed by the moving image identifying unit **216** is “SCENE C, SCENE A, SCENE D, SCENE B, SCENE E”.

In this case, the reproduction time lengths of the respective scenes are sequentially obtained from the scene table **204**. Here, the reproduction time lengths of the scenes C and A are respectively 10 seconds and the reproduction time length of the scene D is 20 seconds, whereby the total reproduction time lengths so far is 40 seconds. The reproduction time length of the next scene B is 20 seconds. Therefore, since the reproduction start position information indicates “45 seconds”, it is possible to identify that the reproduction start position information indicates a position **1002** at five seconds from the start of the scene B.

A sequence order **1003** of the current moving image **202** can be get from the moving image **202** itself. Here, it is assumed that the sequence order **1003** of the scenes of the current moving image **202** is “SCENE C, SCENE E, SCENE D, SCENE A, SCENE B”. In this case, it is understood that the start point of the scene B identified in the previous process is at the position of 70 seconds in the whole of the current moving image **202** (reproduction start scene position information). The point (position) at five seconds from the start of the scene B corresponds to a position **1004** of 75 seconds in the whole of the current moving image **202**, and this position can be determined as the reproduction start position.

Although it has been identified in which scene the reproduction start position exists in **S603** of FIG. 6, there is a case where the scene does not already exist in the current moving image **202**. If it is determined in **S604** that the scene in which the reproduction start position has been identified does not exist, the moving image identifying unit **216** and the reproduction start position determining unit **217** perform the process (**S607**) of identifying the reproduction start position in the case where the scene has been deleted. In any case, an example of the process (**S607**) of identifying the reproduction start position will be described with reference to the flow chart illustrated in FIG. 11.

In **S1101**, the moving image identifying unit **216** restarts the process of identifying the sequence order of the scenes, which has been partially performed. First, the moving image identifying unit **216** obtains the change information which is the edited content of the scene corresponding to the next version number, from the editing history information of the history table **203**.

Next, in **S1102**, the moving image identifying unit **216** applies the change information obtained from the history table **203**, to the temporarily stored sequence of the scenes.

Next, in **S1103**, it is determined whether or not the scene in which the reproduction start position has been identified is deleted. Then, the process advances to **S1104** if it is

determined that the scene is deleted, while the process returns to **S1101** if it is determined that the scene is not deleted yet.

In **S1104**, the reproduction start position at the head of the scene subsequent to the above scene. Here, if there is no scene subsequent to the above scene, the reproduction start position may be set to the previous scene of the above scene. In other words, the moving image identifying unit performs a scene determining process of determining a scene adjacent to the deleted scene in the moving image at the point when the deleted scene existed.

When the reproduction start position is set at the new position, it is determined in **S604** whether or not the scene to which the new reproduction start position was set has been deleted in the current moving image **202**. Even if it is determined that the relevant scene has been deleted, it only has to again perform the processes of the flow chart illustrated in FIG. 11. On the other hand, if it is determined that the relevant scene is not deleted, the process advances to **S605** to determine the reproduction start position in the current moving image, and then the process further advances to **S606** to reproduce the moving image **202**.

The above processes will be described concretely with reference to FIG. 12. For example, it is assumed that, as a result of the processes in **S602** and **S603**, a reproduction start position **1202** in a sequence **1201** of the scenes of the moving image **202** constructed by the moving image identifying unit **216** could be identified as being on the way of the scene D. However, the scene D does not exist in a sequence order **1205** of the scenes of the current moving image **202**. In this case, the moving image identifying unit **216** repeats the respective processes in **S1101** to **S1103** to obtain a sequence order **1203** of the scenes in the case where the scene D was deleted. Here, in the sequence order of the scenes immediately before the deletion of the scene D, when the scene subsequent to the scene D is the scene B, a reproduction start position **1204** is set at the head of the scene B. Finally, it is possible in **S605** to determine a reproduction start position **1206** in the sequence order **1205** of the current scenes.

<Second Embodiment>

Hereinafter, the second embodiment of the present invention will be described. In the present embodiment, the descriptions of the parts which overlap those in the first embodiment will be omitted.

FIG. 3B is a diagram illustrating an example of a history table **203** to be used in the present embodiment. In the present embodiment, a date and time at which a moving image **202** was edited is used as history identification information, and editing history information is used as change information. However, unlike the first embodiment, a sequence order of scenes of the moving image **202** at the point when the history table **203** was created is not recorded.

FIG. 4B is a diagram illustrating an example of a scene table **204** to be used in the present embodiment. In the present embodiment, a scene identifier of each scene and the number of frames acting as a scene length of each scene are associated with each other and recorded, and the relevant scene length is treated as with the reproduction time length in the first embodiment. Besides, reproduction start position information does not represent a time but represents a frame number.

Subsequently, a processing flow in the present embodiment will be described. Initially, in the present embodiment, an example of the processing flow of a process of a moving

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image editing processing unit **207** for editing the moving image **202** will be described with reference to a flow chart illustrated in FIG. **13**.

Here, processes in **S1301** and **S1302** are equivalent to those in **S501** and **S502** respectively. On the scene table **204** to be created, the scene identifier of each of the scenes constituting the moving image **202** and the scene length of the corresponding scene have been obtained and associated with each other. Since processes in **S1303** to **S1305** are the same as those in **S505** to **S507** respectively, the descriptions of these processes will be omitted.

Next, in **S1306**, a moving image editing unit **213** confirms whether or not the history table **203** corresponding to the moving image **202** exists. If the history table **203** does not exist, in **S1307**, the history table **203** for the moving image **202** is newly created.

Finally, in **S1308**, a history storage unit **214** associates the change information and the date and time with each other and records them on the history table **203**.

In the present embodiment, processes of an information generation processing unit **206** for generating reproduction information of the moving image **202** are substantially the same as those described in the first embodiment. In the present embodiment, an information code **205** generated by an information generating unit **210** includes a moving image identifier of the moving image **202** to be reproduced, a date and time when the information code **205** was generated, and a reproduction start position (frame number) of the moving image **202**. Here, a date and time when the moving image **202** was last edited may be used instead of the date and time when the information code **205** was generated.

In the present embodiment, processes of a moving image reproduction processing unit **208** for reproducing the moving image **202** are substantially the same as those described in the first embodiment (FIG. **6**). Then, the process (**S602**) of identifying a sequence order of scenes will be described with reference to the flow chart illustrated in FIG. **14**.

First, in **S1401**, a moving image identifying unit **216** obtains the sequence of the scenes of the current moving image **202**, and temporarily stores them.

Next, in **S1402**, the moving image identifying unit **216** compares the date and time obtained from the information code **205** and a latest editing date and time stored in the history table **203** with each other. Then, if the date and time obtained from the information code **205** is newer than or the same as the latest editing date and time, subsequent processes are not performed. This is because, since the moving image **202** is not edited after the information code **205** was generated, it turns out at this point that the sequence order of the scenes is not changed.

Next, in **S1403**, the change information of one line being the edited content of the scene is obtained from the history table **203**. In the first embodiment, the edited contents are obtained from the oldest. However, in the present embodiment, the edited contents are obtained from the newest.

Next, in **S1404**, the change information obtained from the history table **203** is applied to the temporarily stored sequence of the scenes.

Finally, in **S1405**, the date and time obtained from the information code **205** and the editing date and time of the editing history obtained from the history table **203** and applied in **S1404** are compared with each other. Then, if the date and time obtained from the information code **205** is newer or the same, the process of identifying the sequence order of the scenes is terminated. On the other hand, if not, the process returns to **S1403**.

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After then, a process of determining the reproduction start position and a process of reproducing the moving image **202** from the determined reproduction start position are respectively substantially the same as those in the first embodiment, although the reproduction start position is indicated not by the time but by the frame number. Therefore, the descriptions of these processes will be omitted.

As just described, according to the second embodiment, it is possible to identify the sequence order of the scenes by retracing the history information from the sequence order of the scenes of the current moving image **202**, then determine the reproduction start position, and reproduce the moving image **202** from the point that a user desires.

<Third Embodiment>

Hereinafter, the third embodiment of the present invention will be described. In the present embodiment, the descriptions of the parts which overlap those in the first and second embodiments will be omitted.

In the present embodiment, although a broad flow of a process of a moving image editing processing unit **207** for editing a moving image **202** is substantially the same as those in the first and second embodiments (FIGS. **5** and **13**), a process of recording change information in a history table **203** is different from the processes (**S509**, **S1308**).

FIG. **3C** is a diagram illustrating an example of the history table **203** to be used in the present embodiment. In the first and second embodiments, the differences between the sequences of the scenes in the moving image **202** before the editing and the sequences of the scenes of the moving image **202** after the editing are recorded as the change information on the history table **203**. However, in the present embodiment, a sequence order of scenes for each editing is recorded.

For example, it is assumed that the sequence of the scenes of the moving image **202** before editing is "SCENE A, SCENE B, SCENE C" and the sequence of the scenes of the moving image **202** after editing is "SCENE B, SCENE A, SCENE C". In this case, the change information such as "place SCENE B at the head", "move SCENE B behind SCENE A" and the like is recorded on the history table **203** in the first and second embodiments. On the other hand, in the present embodiment, the sequence order of the scenes of the moving image **202** such as "in order of SCENE B, SCENE A, SCENE C" or the like is recorded as it is on the history table **203** as the change information corresponding to the moving image **202** after the editing.

Subsequently, in the process of reproducing the moving image **202** in the first and second embodiments (FIG. **6**), a process of a moving image reproduction processing unit **208** for identifying the sequence order of the scenes (**S602**) will be described.

A moving image identifying unit **216** obtains, from the history table **203**, change information corresponding to history identification information obtained from an information code **205**. Since the sequence order as described above has been recorded on the history table **203** in the present embodiment, the moving image identifying unit **216** stores the information obtained as the sequence order of the scenes, and the process of identifying the sequence order of the scenes is terminated.

After then, since a process of determining a reproduction start position and a process of reproducing the moving image **202** from the determined reproduction start position are the same as those in the first and second embodiments, the descriptions of these processes will be omitted.

As just described, according to the third embodiment, it is possible to immediately identify the sequence order of the

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scenes from the history identification information and the history table **203**, then determine the reproduction start position, and reproduce the moving image **202** from the point that a user desires.

<Fourth Embodiment>

Hereinafter, the fourth embodiment of the present invention will be described. In the present embodiment, the descriptions of the parts which overlap those in the first to third embodiments will be omitted.

In the present embodiment, in addition to such editing methods as described in the above embodiments, there is provided an editing method of changing the length of a scene itself by dividing one scene into a plurality of scenes, or deleting the head or the end of a certain scene. Hereinafter, a flow of an editing process in the present embodiment will be described.

Initially, a flow of a process of dividing one scene into a plurality of scenes in the present embodiment will be described. Here, it should be noted that this process is performed as an example of processes of a moving image editing unit **213** for editing a moving image **202** in the processes of FIGS. **5** and **13** (**S505**, **S1303**).

First, the moving image editing unit **213** selects an arbitrary place in the scene included in the moving image **202**, and divides the relevant scene into two scenes one corresponding to the portion before the selected place and the other corresponding to the portion after the selected place.

Next, the divided two scenes are recorded respectively as new scenes on a scene table **204**. For example, if a scene A having 40 seconds as the reproduction time length is divided into two scenes at the place of 10 seconds from the head of the scene A, two new scenes one having 10 seconds as the reproduction time length and the other having 30 seconds as the reproduction time length are obtained. Further, new identifiers such as scenes B and C are allocated respectively to the two new scenes, and these scenes are held at the location of the scene A instead of the scene A. Furthermore, the scenes B and C are recorded together with the respective reproduction time lengths on the scene table **204**.

Subsequent processes are performed as with the processes in **S506** and **S1303** and their subsequent steps in the above embodiments. Further, in case of dividing the scene into three or more scenes, it is possible to do so by repeating the above processes of dividing the scene into the two scenes.

Subsequently, a flow of a process of deleting a part of one scene in the present embodiment will be described. Here, it should be noted that this process is performed as an example of a process of a moving image editing unit **213** for editing the moving image **202** in the processes of FIG. **5** (**S505**).

First, the moving image editing unit **213** selects an arbitrary place in the scene included in the moving image **202**, deletes the portion before or after the selected place, and leaves the remaining portion as it is.

Next, the portion not deleted in the scene the part of which has been deleted is recorded as a new scene on the scene table **204**.

For example, it is assumed that there is a scene D having 40 seconds as the reproduction time length. Here, if the portion at the place of 20 seconds from the head of the scene D and the subsequent portion are deleted, the remaining portion having 20 seconds as the reproduction time length is recorded as the new scene. Further, a new identifier such as a scene E is allocated to the new scene, this scene is held at the location of the scene D instead of the scene D, and the scene originally subsequent to the scene D becomes the scene newly subsequent to the new scene E. Furthermore,

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the scene E is recorded together with the reproduction time length of the scene E on the scene table **204**. Subsequent processes are performed as with the processes in **S506** and **S1303** and their subsequent steps in the above embodiments.

Next, a method of identifying a reproduction start position in such a scene dividing process as described above will be described with reference to FIGS. **15A** and **15B**. It should be noted that this method corresponds to the process of **S1104** in the above embodiment.

It is assumed that there is the reproduction start position in a scene A **1501** which is one of the scenes constituting the moving image. In a case where a moving image identifying unit **216** obtains change information of a scene corresponding to a next version number from a history table **203**, when the scene A **1501** has been divided into a scene B and a scene C **1503**, a new reproduction start position is set on either the scene B or the scene C.

The reproduction start position is set at the equivalent position in both a case where the scene A **1501** is reproduced from its head and a case where the scene B and the scene C **1503** are reproduced from their heads. Then, it is assumed that the reproduction time length of the scene A **1501** is 40 seconds, and this scene A is divided into the scene B having 10 seconds from its head and the scene C having 30 second subsequent to the scene B.

As illustrated in FIG. **15A**, if it is assumed that a reproduction start position **1502** is at the point of five seconds from the head of the scene A, a reproduction start position **1504** after the division is set at the point of five seconds from the head of the scene B. Moreover, as illustrated in FIG. **15B**, if it is assumed that a reproduction start position **1505** is at the point of 30 seconds from the head of the scene A, a reproduction start position **1506** after the division is set at the point of 20 seconds from the head of the scene C.

Next, a method of identifying a reproduction start position in such a process of deleting a part of the scene as described above will be described with reference to FIGS. **16A**, **16B** and **16C**.

It is assumed that a scene D and a scene F are arranged in this order in a certain portion of the moving image as indicated by a constitution **1601** and there is a reproduction start position in the scene D. Moreover, it is assumed that, in a case where the moving image identifying unit **216** has obtained change information of a scene corresponding to a next version number from the history table **203**, the scene D has been deleted partially and the portion not deleted remains as a scene E.

In this instance, a case where a reproduction start position **1602** is not set at the deleted portion will be first described. In this case, as indicated by a constitution **1603** in FIG. **16A**, the reproduction start position **1602** is set at a position **1604** which is equivalent in both a case where the scene D is reproduced from its head and a case where the scene E including the deleted portion is reproduced from its head. However, if the reproduction start position is set in the deleted portion, this reproduction start position is shifted and set at another position.

For example, as indicated by a constitution **1606** in FIG. **16B**, if the head side of the scene D has been deleted and there is an identified reproduction start position **1605** in the deleted portion, then a new reproduction start position **1608** is set at the head of the scene E.

Further, as indicated by a constitution **1610** in FIG. **16C**, a case where the end side of the scene D has been deleted and there is an identified reproduction start position **1609** in the deleted portion will be described. In this case, a new reproduction start position **1612** is set at the end of the scene

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E or at the head of the scene F existing subsequent to the scene D as indicated by a constitution 1611.

Although an editing method of dividing a certain scene into three or more scenes is conceivable as another editing method, this method can be achieved by repeating scene division. Further, although an editing method of partially deleting a halfway portion of a certain scene is conceivable as still another editing method, this method can be achieved by properly combining scene division and deletion of the head or the end of a scene. Therefore, descriptions of these methods will be omitted here.

<Other Embodiments>

The embodiments of the present invention have been described in detail as above. Here, it should be noted that the present invention can be achieved by properly combining the above embodiments. For example, it is possible to identify a sequence order of scenes in reverse chronological order on the history table 203 by using editing dates and times as history identification information, and reproduce a moving image by using a frame number as a reproduction start position.

It is possible according to the present invention to provide a moving image reproducing method which can reproduce a moving image after editing from the middle thereof, as well as a moving image before editing. Besides, by simultaneously providing the methods according to the present invention, the conventional method of reproducing a moving image from its head, a method of reproducing a moving image after editing as it is from a reproduction start position set before the editing of the moving image, and the like, it is possible to cause a user to select each of these methods.

The embodiments of the present invention can also be realized by a computer of a system or an apparatus that reads out and executes computer executable instructions recorded on a storage medium (e.g., a non-transitory computer-readable storage medium) to perform the functions of one or more of the above-described embodiments of the present invention, and by a method performed by the computer of the system or the apparatus by, for example, reading out and executing the computer executable instructions from the storage medium to perform the functions of one or more of the above-described embodiments. The computer may comprise one or more of a central processing unit (CPU), a micro processing unit (MPU) and another circuitry, and may include a network of separate computers or separate computer processors. The computer executable instructions may be provided to the computer, for example, from a network or the storage medium. The storage medium may include, for example, one or more of a hard disk, a random-access memory (RAM), a read only memory (ROM), storages of distributed computing systems, an optical disc (such as a compact disc (CD), a digital versatile disc (DVD), or a Blu-ray Disc (BD)TM), a flash memory device, a memory card, and the like.

While the present invention has been described with reference to the exemplary embodiments, it is to be understood that the invention is not limited to the disclosed exemplary embodiments. The scope of the following claims is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures and functions.

This application claims the benefit of Japanese Patent Application No. 2012-053604, filed Mar. 9, 2012, which is hereby incorporated by reference herein in its entirety.

What is claimed is:

1. A reproduction apparatus which reproduces an editable moving image of a present version thereof comprising a

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sequence of scenes, wherein structures of editable moving images of a plurality of past versions thereof, comprising a different sequence of the scenes from the present version, are identified by edit history information recorded in a storage device, comprising:

an inputting unit configured to input identification information specifying the editable moving image of a specified past version of the plurality of past versions and start information designating a reproduction start position of the specified past version that is a start position measured from the beginning of the sequence of scenes of the specified past version; and

an identifying unit configured

to identify one of the scenes that is included in a sequence of the scenes of the specified past version and includes the reproduction start position of the specified past version, based on the edit history information,

to identify a position in the one of the scenes corresponding to the reproduction start position of the specified past version, based on the edit history information, and

to identify a reproduction start position of the present version that is a position measured from the beginning of the sequence of scenes of the present version, based on the one of the scenes that includes the reproduction start position of the specified past version and the position in the one of the scenes corresponding to the reproduction start position of the specified past version for reproducing the editable moving image of the present version from the reproduction start position of the present version.

2. The reproduction apparatus according to claim 1, wherein

the length of scenes included in the editable moving images of past versions are identified by the edit history information recorded in the storage device, and

the identifying unit identifies the reproduction start position of the present version, on the basis of the length of the scenes identified by the edit history, the one of the scenes that includes the reproduction start position of the specified past version, and the position in the one of the scenes corresponding to the reproduction start position of the specified past version.

3. The reproduction apparatus according to claim 1, wherein in a case where the reproduction start position of the specified past version designates a position in one of a plurality of scenes deleted from the editable moving image of the past version, the identifying unit identifies a start position of a second scene in the editable moving image of the present version, which follows a first scene in the editable moving image of the specified past version, as the reproduction start position of the present version.

4. The reproduction apparatus according to claim 1, further comprising an output unit configured to output position information and an image associated with each other, wherein the position information indicates the reproduction start position of the specified past version, and the image is included in the editable moving image of the specified past version and corresponds to the position information.

5. The reproduction apparatus according to claim 1, wherein the edit history information includes information indicating a change of reproduction order of a plurality of scenes included in the editable moving image.

6. The reproduction apparatus according to claim 1, wherein the edit history information includes information

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indicating a date and time when a position of a scene included in the editable moving image was changed.

7. The reproduction apparatus according to claim 1, wherein the edit history information includes information indicating a version number of the editable moving image updated according to a change of a position of a scene included in the editable moving image.

8. The reproduction apparatus according to claim 1, wherein the start information includes information indicating a frame number of a position from which the reproduction of the editable moving image is started.

9. The reproduction apparatus according to claim 1, wherein the reproduction start position is counted from a head position of the editable moving image.

10. A reproduction method which reproduces an editable moving image of a present version thereof, comprising a sequence of scenes, wherein structures of editable moving images of a plurality of past version thereof, comprising a different sequence of scenes from the present version, are identified by edit history information recorded in a storage device, the reproduction method comprising:

inputting identification information specifying the editable moving image of a specified past version of the plurality of past versions and start information designating a reproduction start position of the specified past version that is a start position measured from the beginning of the sequence of scenes of the specified past version;

identifying one of the scenes that is included in a sequence of the scenes of the specified past version and includes the reproduction start position of the specified past version based on the edit history information;

identifying a position in the one of the scenes corresponding to the reproduction start position of the specified past version based on the edit history information; and

identifying a reproduction start position of the present version that is a position measured from the beginning of the sequence of scenes of the present version, based on the one of the scenes that includes the reproduction start position of the specified past version and the position in the one of the scenes corresponding to the reproduction start position of the specified past version for reproducing the editable moving image of the present version from the reproduction start position of the present version.

11. The reproduction method according to claim 10, wherein

the length of scenes included in the editable moving images of the past versions are identified by the edit history information recorded in the storing device, and in the identifying step, the reproduction start position of the present version is identified on the basis of the stored length of the scenes identified by the edit history, the one of the scenes that includes the reproduction start position of the specified past version, and the position in the one of the scenes corresponding to the reproduction start position of the specified past version.

12. The reproduction method according to claim 10, wherein in a case where the reproduction start position of the specified past version designates a position in one of a plurality of scenes deleted from the editable moving image of the past version, a start position of a second scene in the editable moving image of the present version, which follows a first scene in the editable moving image of the specified past version, is identified in the identifying step as the reproduction start position of the present version.

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13. The reproduction method according to claim 10, wherein the reproduction start position is counted from a head position of the editable moving image.

14. A non-transitory computer-readable storage medium which stores a program for causing a computer to execute a process of reproducing an editable moving image of a present version thereof, comprising a sequence of scenes, wherein structures of editable moving images of a plurality of past versions thereof, comprising a different sequence of scenes from the present version, are identified by edit history information recorded in a storage device, the process of the program comprising:

an inputting step of inputting identification information specifying the editable moving image of a specified past version of the plurality of past versions and start information designating a reproduction start position of the specified past version that is a start position measured from the beginning of the sequence of scenes of the specified past version;

an identifying step of identifying one of the scenes that is included in a sequence of the scenes of the specified past version and includes the reproduction start position of the specified past version based on the edit history information;

an identifying step of identifying a position in the one of the scenes corresponding to the reproduction start position of the specified past version based on the edit history information; and

an identifying step of identifying a reproduction start position of the present version that is a position measured from the beginning of the sequence of scenes of the present version, based on the one of the scenes that includes the reproduction start position of the specified past version and the position in the one of the scenes corresponding to the reproduction start position of the specified past version for reproducing the editable moving image of the present version from the reproduction start position of the present version.

15. The non-transitory computer-readable storage medium according to claim 14, wherein

the length of scenes included in the editable moving images of the past versions are identified by the edit history information recorded in the storage device, and in the identifying step, the reproduction start position of the present version is identified on the basis of the stored length of the scenes identified by the edit history, one of the scenes that includes the reproduction start position of the specified past version, and the position in the one of the scenes corresponding to the reproduction start position of the specified past version.

16. The non-transitory computer-readable storage medium according to claim 14, wherein in a case where the reproduction start position of the specified past version designates a position in one of a plurality of scenes deleted from the editable moving image of the past version, a start position of a second scene in the editable moving image of the present version, which follows a first scene in the editable moving image of the specified past version, is identified in the identifying step as the reproduction start position of the present version.

17. The non-transitory computer-readable storage medium according to claim 14, wherein the reproduction start position is counted from a head position of the editable moving image.

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